

REMARKS/ARGUMENTS

Claims 1-41 are pending in the application. Claims 14-16, 26, and 31 are allowed. Claims 1-13, 17-25, 27-30, and 32-41 are rejected. Claims 4, 19, and 29 are objected to. Claims 14, 19, 22, 23, 32, 35, and 40 are hereby canceled.

Amendments to the Specification:

Paragraph [0045] contains an obvious error. It is clear from the specification that the chemical hydrides are involved in a reaction to form hydrogen, not the metal hydrides. No new matter is added by this amendment to the specification.

Amendments to the Claims:

Independent Claim 1 (currently amended) has been amended to further limit the hydrogen storage canister to comprise at least one metal hydride. Claim 1 has also been amended to specifically set forth that the chemical hydride is for generating pressurized hydrogen gas by a reaction of the chemical hydride, and specifically set forth that the pressurized hydrogen gas generated is stored in the hydrogen storage canister as supported by paragraph [0025]. No new matter is added by this amendment to the claim.

Claim 3 (currently amended) has been amended to correct for proper antecedent basis. No new matter is added.

Claim 4 (currently amended) has been amended to place the claim in proper dependent form and to correct for proper antecedent basis. No new matter is added.

Claim 6 (currently amended) has been amended to properly depend from the system of claim 1. (emphasis added). No new matter is added.

Claim 8 (currently amended) has been amended to include ammonia as one of the components which may be included in the second compartment. Support for this amendment is found in Paragraph [0035], where it states, in part, "Preferably, at least the second compartment, comprising an aqueous solution or ammonia, ..." No new matter is added.

Claim 9 (currently amended) has been amended to recite the first compartment and the second compartment rather than first and second compartments. No new matter is added.

As a matter of convenience, Claim 14 has been canceled and the scope of Claim 14 has been merged into allowed Claim 15 (currently amended). Claim 15 was further amended to properly reflect that “the at least one metal hydride” was added to a claim from which Claim 15 depends. No new matter is added.

Claim 16 (currently amended) was amended to depend from Claim 1 instead of Claim 8. No new matter is added.

Claim 18 (currently amended) was amended to include a limitation from dependent Claim 19 and further limit the chemical hydride in a form of an aqueous solution. (emphasis added). Paragraph [0038] states, in part, that:

“The at least one chemical hydride can be supplied in the form of a solid, liquid or an aqueous solution, wherein at least a portion of the chemical hydride is in the form of a solution.” (emphasis added).

No new matter is added.

Claim 20 (currently amended) has been amended to depend from Claim 18 instead of canceled Claim 19. No new matter is added.

Claim 21 (currently amended) has been amended to specifically point out that the aqueous solution is the aqueous solution of the at least one chemical hydride.

Claim 24 and Claim 25 have been amended to depend from Claim 18 instead of canceled Claim 19. No new matter is added.

Claim 26 (currently amended) was amended to properly reflect that “the at least one metal hydride” was incorporated into Claim 1. Claim 26 was also amended to depend from Claim 18 instead of canceled Claim 19. No new matter is added.

Claim 27 (currently amended) was amended to depend from Claim 18 instead of Claim 26 and to reflect that since metal hydride is a modifier of the listed alloys, the listed alloys are metal hydrides. No new matter is added.

Claim 28, Claim 29 and Claim 31 have been amended to depend from Claim 18 instead of canceled Claim 19. No new matter is added.

Claim 33 (currently amended) has been amended to reflect that the reaction of the at least one chemical hydride is in a hydrogen gas generator and that the step of collecting and storing is in a hydrogen storage vessel comprising at least one metal hydride. (emphasis added). No new matter is added.

Claim 34 (currently amended) has been amended for better form. No new matter is added.

Claims 36, 37 and 38 have been amended to depend from Claim 33 instead of cancelled Claim 35 and to correct obvious typographical errors. No new matter is added.

Claim 39 is amended to incorporate the scope of claim 40 and to point out that the chemical hydride is supplied, at least in part, as an aqueous solution. Paragraph [0041] states, in part, that “The at least one chemical hydride can be supplied in the form of a solid, a liquid or an aqueous solution...” (emphasis added). No new matter is added.

Claim 41 has been amended to correct obvious typographical errors. No new matter is added.

Claim Objections

a) Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Examiner states that:

“Applicant is required to cancel the claim(s), or amend the claim(s) to place the claims(s) in proper dependent form, or rewrite the claims(s) in independent form. Claim 4 improperly broadens the Markush group recited in claim 3 by including the provision of a “vessel”.”

Applicants have amended claim 4 to depend from claim 2 to put the claim in proper dependent form. The amendment of the claim does not present new matter.

Applicants respectfully submit that Claim 4 (currently amended) is now in proper form and request the Examiner to withdraw such objection.

b) Claim 29 is objected to under 37 CFR 1.75 (c) as being of improper dependent form for failing to further limit the subject matter of a previous claim. Examiner states that:

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"Applicant is required to cancel the claim(s), or amend the claim(s) to place the claims(s) in proper dependent form, or rewrite the claims(s) in independent form. Claim 29 improperly broadens the Markush group recited in claim 28 by including the provision of a "vessel"."

Applicants have amended Claim 29 to place the claim in proper dependent form. The amendment of the claim does not present new matter.

Applicants respectfully submit that Claim 29 (currently amended) is now in proper form and request the Examiner to withdraw such objection.

c) Claim 19 is objected to because ammonia is not consider to be a solution.

Applicants have canceled Claim 19, rendering the objection moot.

Claim Rejections – 35 USC §112

Enablement Rejections

a) Claims 11, 20, 21, 22, 38 and 39 are rejected under 35 U.S.C. 112 first paragraph, as based on a disclosure which is not enabling. The examiner states:

"It is critical or essential to the practice of the invention, for either the claims or the specification to provide specific examples of the "promoter" mentioned in claims 11, 20, 21, 22, 38 and 39, but neither the claims or the specification provide any specific examples of the claimed "promoter". The definition of "promoter" set forth on pg. 9 lines 6 and 7 in the applicants' specification that it is an initiator or catalyst only raise the question of which initiators and which catalysts are contemplated by the inventors." (emphasis added).

The Examiner states that the Applicants have failed to identify specific examples of promoters needed for practicing the claimed invention. Useful promoters are identified at paragraph [0045] of the application. Paragraph [0045] states, in part:

"Such promoters include, but are not limited to, transition metals, transition metal borides, alloys of these materials, and mixtures thereof. Transition metal promoters useful in the promoter systems of the present invention are described in U.S. Pat. No. 5,804,329, issued to Amendola, which is incorporated herein by reference in its entirety for all purposes. Transition metal promoters, as used herein, are promoters containing Group IB to Group VIIIB metals of the periodic table or compounds made from these metals. Examples of useful transition metal elements and compounds include, but are not limited to, ruthenium, iron, cobalt, nickel, copper, manganese, rhodium, rhenium, platinum, palladium, chromium, silver, osmium, iridium, alloys thereof, salts thereof including chlorides and borides, and mixtures thereof. Preferred salts include cobalt chloride, iron chloride and nickel chloride." (emphasis added).

Useful promoters are underscored in the above text.

The application also incorporates by reference the complete disclosure of United States Patent Application Document No. 2003/0037487. United States Patent Application Document No. 2003/0037487, in paragraph [0071], discloses catalysts, including transition metal catalysts, which satisfy the promoter definition of the instant application.

Applicants respectfully submit that the enablement rejection is therefore improper and Applicants respectfully request the Examiner to withdraw such rejection.

Indefiniteness Rejections

Claims 1, 6, 18, 19, 22, 27, 36 and 39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a) The Examiner states that:

"Claim 1 does not particularly point out and distinctly set forth the means for generation hydrogen gas as set forth in the preamble of the claim. The invention of claim 1 only sets forth an apparatus comprising a chemical hydride storage compartment and a hydrogen storage compartment, the preamble of claim 1 sets forth that the invention generates hydrogen gas. So where are the limitations directed to the generation of hydrogen gas set forth in Claim 1?"

Applicants have amended claim 1. Claim 1 includes a hydrogen gas generator which comprises a compartment containing at least one chemical hydride for irreversibly generating pressurized hydrogen gas by a chemical reaction of the at least one chemical hydride. (emphasis added.) Claim 1, as amended is fully supported, for example in paragraph [0025] which states, in part:

"...irreversibly generating pressurized hydrogen gas by a chemical reaction of at least one chemical hydride..."

The amendment does not present new matter.

Applicants respectfully submit that Claim 1 (currently amended) particularly points out and distinctly sets forth the means for generating hydrogen gas by a chemical reaction of the at least one chemical hydride. Applicants respectfully request the Examiner to withdraw such rejection.

b) The Examiner states that:

"Claim 6 does not particularly point out and distinctly set forth how the "aluminum metal", "magnesium metal" and "magnesium/iron alloys" can be considered to be hydrides because they lack atomic hydrogen in their chemical composition. (emphasis added).

Likewise, claim 27 does not particularly point out and distinctly set forth how the members of the Markush group set forth therein can be considered to be hydrides because they also lack atomic hydrogen in their chemical composition."

The Examiner is directed to paragraph [0030] where it states that "The term "chemical hydride", as defined herein, is understood to mean a material or materials that liberate hydrogen in an irreversible reaction. Further, in paragraph [0031], it states that:

"The chemical hydrides utilized in the system of the invention may or may not include hydride ions, and may be of any suitable physical form, including, but not limited to, solid, liquid and aqueous solution." (emphasis added)

In paragraph [0044], it states that:

"Specific examples of suitable chemical hydrides include, but are not limited to, ammonia borane (NH_3BH_3), sodium borohydride, lithium borohydride, sodium aluminum hydride, lithium aluminum hydride, lithium hydride, sodium hydride, calcium hydride, magnesium hydride, aluminum metal, magnesium metal and magnesium/iron alloys." (emphasis added)

Applicants therefore define what they mean by "chemical hydride" and provide examples including aluminum metal, magnesium metal and magnesium/iron alloys.

Applicants respectfully submit that Claim 6 (currently amended) particularly points out and distinctly sets forth how aluminum metal, magnesium metal, and magnesium/iron alloys are considered to be chemical hydrides using the definition set forth in the specification by the Applicants. Applicants respectfully request the Examiner to withdraw such rejection.

Claim 27 is directed to an embodiment where the hydrogen storage canister comprises named metal hydrides. In claim 27, metal hydride is a modifier of the listed alloys. Claim 27 is amended to reflect that the listed alloys are metal hydrides. No new matter is added.

Applicants respectfully submit that Claim 27 (currently amended) particularly points out and distinctly sets forth how TiFe , $\text{Ti}_{0.98}\text{Zr}_{0.02}\text{V}_{0.43}\text{Fe}_{0.09}\text{Cr}_{0.05}\text{Mn}_{1.5}$; MmNi_5 metal hydrides are consider to be metal hydrides.

Applicants respectfully request the Examiner to withdraw such rejection.

c) The Examiner states that:

"Claim 18 does not particularly point out and distinctly set forth how the recitation that the chemical hydride is in the form of a solution further limits the claimed invention. In other words, the chemical hydride is in the form of a solution as a consequence of a method step, but this method step does not further limit the claimed system. There are no specific limitations in either claim 1 or 18 that water be added to the chemical hydride to form a solution of the chemical hydride, but the claim raises the question of whether or not this is a consequence of adding the aqueous solution of claim 8 to the chemical hydride of claim 1. The claim language suggests that the chemical hydride be initially put into the compartment in the form of an aqueous solution prior to the generation of hydrogen gas, but this does not appear to be the applicants' intention. Lastly, adding water to the chemical hydride would not appear to produce a solution of chemical hydride, but rather hydrogen gas and some other chemical compound. (emphasis added).

Paragraph [0038] states, in part, that:

"The at least one chemical hydride can be supplied in the form of a solid, liquid or an aqueous solution, wherein at least a portion of the chemical hydride is in the form of a solution." (emphasis added).

Claim 18, as amended, is drawn to the embodiment of the invention where the chemical hydride, prior to reaction, as the claim language suggests, is in the form of an aqueous solution. It is well known in the art that some chemical hydrides may exist in an aqueous solution without reacting. A promoter may then be added to these chemical hydrides, thereby causing the reaction to generate hydrogen to occur.

Claim 18, as amended, is fully supported as pointed out above, paragraph [0038], and does not present new matter.

Applicants respectfully submit that Claim 18 does particularly point out and distinctly set forth how the recitation that the chemical hydride is in the form of an aqueous solution, rather than a solid, further limits the claimed invention.

Applicants respectfully request the Examiner to withdraw such rejection.

d) The Examiner states that:

"Claim 39 does not particularly point out and distinctly set forth if the solution of chemical hydride set forth is a consequence of adding water to the solid chemical hydride to produce hydrogen gas and some other chemical compound, or if the applicants simply insert a solution of chemical hydride into the compartment prior to the generation of hydrogen gas as suggested by claim 39 (but this doesn't appear to be the applicants' intention). If you add water to the chemical hydride it would not seem that you would produce a solution of chemical hydride (but of some other chemical compound). (emphasis added).

Claim 39 is amended to incorporate the scope of claim 40 and to point out that the chemical hydride is supplied, at least in part, as an aqueous solution. Paragraph [0041] states, in part, that:

"The at least one chemical hydride can be supplied in the form of a solid, a liquid or an aqueous solution..." (emphasis added.)

Claim 39, as amended, is drawn to the embodiment of the invention where the chemical hydride, prior to the generation of hydrogen gas is in the form of an aqueous solution.

As pointed out in the discussion of Claim 18, it is well known in the art that some chemical hydrides may exist in an aqueous solution without reacting. A promoter may then be added to these chemical hydrides, thereby causing the reaction to generate hydrogen to occur.

Claim 39, as amended, is fully supported as pointed out above, paragraph [0041], and does not present new matter.

Applicants respectfully submit that Claim 39, as amended, does particularly point out and distinctly set forth that, for this embodiment, that the chemical hydride is supplied in the form of an aqueous solution rather than as a consequence of adding water to the solid chemical hydride in the compartment.

Applicants respectfully request the Examiner to withdraw such rejection.

e) The Examiner states that:

"In claims 19 and 36, did the applicants really intend to recite ammonia (i.e. NH₃(gas) or ammonium hydroxide (i.e. NH₄OH(aq.))."

Claim 19 has been canceled rendering the rejection of Claim 19 moot.

Claim 36 (currently amended) does intend to recite ammonia as a material that may be reacted with the chemical hydride to generate hydrogen. For example, the Examiner is drawn to paragraph [0041], which states, in part:

"In another embodiment of the present invention is provided a method for the generation of pressurized hydrogen gas, and the storage of the pressurized hydrogen gas in a hydrogen storage canister. The method comprises the steps of contacting at least one chemical hydride with an aqueous solution or ammonia to form pressurized hydrogen gas. The reaction is effected in a hydrogen gas generator." (*emphasis added*).

Applicants respectfully request the Examiner to withdraw such rejection.

f) The Examiner states that:

"Claim 22 does not particularly point out and distinctly set forth if the "second compartment" set forth in claim 22 is the same or different from the "second compartment" set forth in claims 9 and 17."

Applicants have canceled Claim 22, rendering the rejection moot.

Claim Rejections – 35 USC §102

Anticipation Rejections

Claims 1-3, 6-8, 10-13, 17-22, 24, 25, 28, 32-36, and 38-41 are rejected as being anticipated under 35 U.S.C. § 102(a) by U.S. Patent Application Document No. 2002/0081235 (*Baldwin*).

The present invention pertains to a system and method for generation and storage of pressurized hydrogen gas comprising:

- (a) a hydrogen gas generator that generates the pressurized hydrogen gas by the reaction of a chemical hydride; and
- (b) a hydrogen storage canister comprising at least one metal hydride for storing the pressurized hydrogen gas.

Baldwin teaches in paragraphs 0039-0042:

- (a) a reactor (5) containing aluminum pellets for generating hydrogen;
- (b) a condenser (6); and
- (c) storage tank (7) for storing the hydrogen.

The hydrogen storage canister of the claimed invention comprising at least one metal hydride is different from the storage tank of *Baldwin*. *Baldwin* does not teach a hydrogen storage canister comprising a metal hydride. Moreover, the method of storing the generated hydrogen with a metal hydride as set forth in the claimed invention is not taught by *Baldwin*.

Accordingly, Applicants' Claim 1 and Claim 33 are novel over *Baldwin*.

Each dependent claim, subject to a novelty rejection sets forth the limitation that the hydrogen storage canister "comprises at least one metal hydride". Since *Baldwin* fails to teach a hydrogen storage canister which "comprises at least one metal hydride," each of the dependent claims 2-13, 15-18, 20, 21, 24-31, 34, 36-39 and 41 are novel over *Baldwin*. Applicants respectfully request the Examiner to withdraw such rejection.

Claim Rejections – 35 USC §103

Obviousness Rejections

Claims 1-13, 17-25, 28-30, and 32-41 are rejected for obviousness under 35 U.S.C. § 103(a) over *Baldwin*.

Each claim, subject to an obviousness rejection sets forth a limitation that the hydrogen storage canister “comprises at least one metal hydride”. *Baldwin* fails to teach or suggest utilizing a storage canister which comprises at least one metal hydride. Moreover, *Baldwin* fails to motivate one or ordinary skill in the art to modify the apparatus taught in *Baldwin* by introducing at least one metal hydride in such storage canister. In the absence of such a teaching or motivation, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness and Applicants respectfully request the Examiner to withdraw such rejection.

Since the independent claims are *per se* nonobvious, the dependent Claims 2-13, 15-18, 20, 21, 24-31, 34, 36-39 and 41 are nonobvious. According to MPEP 2143.03, if an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious.

Accordingly, Applicants' claimed invention is novel and nonobvious over *Baldwin*.

The Examiner has advised Applicants of their obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a). Applicants acknowledge that the subject matter of the claims was commonly owned at the time any inventions covered therein were made.

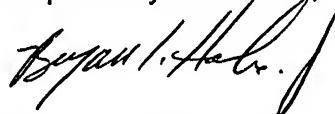
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SUMMARY

For all of the foregoing reasons, Applicants respectfully request withdrawal of the objections to and rejection of Claims 1-13, 15-18, 20, 21, 24-31, 33, 34, 36-39, and 41 and earnestly solicit a Notice of Allowance thereof.

Respectfully submitted,



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